CHAPTER II

REVIEW OF THE RELATED LITERATURE

A careful review and exploration of the literature related to the present study is essential to have insight into the research already carried out in this field. In India very little research has been done as compared to the research conducted in other advanced countries.

While reviewing the related literature attention has been focused on crucial issues like procedure and analysis of the data leading to their findings. A critical view has been taken of various studies whose findings differed from one another even though similar procedures have been used. To make it meaningful and pertinent the present review has been undertaken in the context of establishing norms, construction of tests, and comparison of fitness statuses.

Literature Related to Establishment of Norms

Since norms are essential for evaluating fitness status of individuals, many studies have been conducted for their formulation. The first scientific attempt to formulate national norms was undertaken by the AAHPER. In pursuance of this project a special committee of the AAHPER developed a test battery in 1957. After some improvements the Youth Fitness Test
consisting of six items, both for boys and girls of 10 to 17 years of age, college men and college women were established. These norms were revised and were made more valid and reliable after having them compared with the achievement of the youth of Great Britain, Japan and other countries (AAHPER, 1962).

In another study Mistkawi (1961) made an attempt to prepare national norms for one minute Basketball Throw for goals, pull-ups, potato race, standing hop-step and jump, push-ups, standing broad jump and softball target throw item of YMCA test battery. Two thousand boys of various age groups were tested to formulate norms.

Bitcon (1965) constructed norm tables for the students of grades 9-12. The battery included four items viz Pull-ups, Two minutes sit up, standing broad jump and 300 yards shuttle run. Validity and reliability of these norms were compared with those of AAHPER Youth Fitness Test and the co-efficients found were 0.934 and 0.961 respectively.

In a study confined to five Unity Christian Schools Fox (1967) prepared percentile norms for selected measures of fitness. The components of fitness included were strength, power, agility, flexibility, body composition, cardio-vascular and muscular endurance.

Empirically designed evaluative instrument for assessing the motor fitness of the first, second and third grade girls was developed by Cobb in 1972. A pilot study was conducted on
183 subjects and thirty test items were selected for the project. After a statistical analysis of the data seven items were found to be valid and reliable. These were strength, endurance, leg extension and flexion, sit and reach, dodge run, stick balance and vertical jump.

A similar study was taken by McKinney (1972) to construct and evaluate an instrument for assessing the motor fitness of undergraduate female physical education majors. Forty nine test items were administered to 85 subjects and the resultant data were statistically analysed. Two seven item test batteries were developed. Test battery I contained the highest loading test items—time limit shuttle run, 30 feet shuttle run, cable-tension strength test, head flexion, bench push-ups, Bass-lengthwise Stick Test and Nelson Balance Test. Test battery I was developed to offer better administered test items which included time-limit shuttle run, 30-feet shuttle run, ankle plantar flexion strength, head flexion, bench push-ups, Bass length-wise stick test and 50 yards dash.

Another identical study was undertaken by Shore (1972) to construct motor fitness test battery for lower elementary grade boys. In all thirty test items considered as valid and reliable measures of motor fitness were administered to 238 boys. Two different test batteries each containing seven items were developed after statistical analysis of the data.
Physical fitness norms for Nigerian boys and girls of 11 to 18 years of age were constructed by Anyanwu (1977). The test items included were shuttle run, push-ups for boys, chair push-ups for girls, flexed knee sit-ups, 45 metre dash, standing long jump, pull-ups for boys, flexed arm hang for girls, nine minute run for subjects 11-12 years and 12 minutes run for subjects 13-18 years. A comparison of the mean score of the United States and the Nigerian Youth showed that at the upper age levels, the United States Youth had better physical fitness status than their Nigerian counterparts, whereas at the lower age level there was not much difference.

A research project to construct physical fitness norms for college freshmen of 17 to 19 years of age was undertaken by Zuti and Corbin (1977). For the establishment of these norms they conducted tests for strength, flexibility, body composition, and cardio-vascular efficiency on 3000 freshmen of Kansas State University. Their findings indicated that the norms so established were appropriate for their use at national level.

Barbanti (1983) established physical fitness norms for Brazilian school children. In the physical fitness test battery he included sit and reach test, modified sit-up test, nine-minute run, twelve minute run, 50 metre dash and standing long jump. The tests were administered to 2,342 school boys and girls.
A few studies on establishing norms for physical fitness of school students have been conducted in India. Robson and his colleagues (1978) conducted a study on a simple physical fitness test battery for elementary school children numbering 152 boys and 150 girls of Kendriya Vidyalaya, Gwalior. They prepared norms for classification of children into ability groups based on their physical fitness levels.

Another study was undertaken by Veeraswamy (1978) aimed at assessing the physical fitness levels of the students studying in different schools in Gwalior. AAHPER Youth Fitness Test was given to 212 randomly selected subjects from different schools. The analysis of data indicated that their fitness was related to the degree of regularity in physical activities. It further revealed that physical fitness of the students was independent of their economic status.

Singh (1986) prepared physical fitness norms for high school boys of Punjab State. Data were collected on five thousand subjects from the various schools in the state. The test administered consisted of eight items, i.e., standing broad jump, sit and reach test, Agility run, sit-ups bent knee, 50-metres dash, push-up (chairs), cricketball throw, 600 metres run/walk. The percentile norms for physical fitness tests were found to be valid and suitable to assess the physical fitness level of the high school boys ages 12 to 15 years.

Literature Related to Construction of Tests

In the beginning of the present century when physical education got recognition as a subject in the educational
institutions, many scholars came forward to construct tests to measure physical fitness components of their pupils. More importantly an organised attempt was made by AAHPER (1957) to develop valid and reliable tests to measure physical fitness comprehensively at national level. These tests have been used in various countries with some modifications as per their requirements.

The Canadian Association of Health, Physical Education, and Recreation (1966) constructed tests of physical fitness for boys and girls of 7-17 years of age. In order to cover various components of fitness, the test items included were - one minute speed sit-up, standing broad jump, shuttle run, flexed arm hang, 50 yards run and 300 yards run.

An International Research Programme for the standardization of physical fitness tests was undertaken by a committee appointed by International Council on Health, Physical Education and Recreation (1967). The performance tests were developed in two parts. The basic combination of test items included endurance runs (1000 metres run/walk, 800 metres run/walk), 50 metres sprint, pull-ups, flexed arm hang, standing broad jump and grip strength. Additional test items under special circumstances were also included. These items were 2 minutes sit-ups, repetition bench press (20-30 Kgs, Press), one minute trunk curls, vertical jump, 50 metres shuttle run, back strength, leg strength and arm flexion strength.
Karvonen (1964) conducted physical fitness test on a large number of Finnish Secondary School children in order to assess their fitness levels. A secondary objective of the study was to see the potentiality of the test item in assessing physical fitness. He followed Cureton's (1947) recommendation in the selection of test items. A battery consisting of 19 items supposed to measure balance, flexibility, agility, strength, power, and endurance was prepared. Findings of the study indicated that some of the test items were not suitable for measuring physical fitness since these were of pass-fail type.

Another similar study was carried out by Kunnas and Karvonen (1964) in Helsinki and Lahti. A battery of seven items was applied on the boys of four secondary schools. The battery consisted of step-test, Sargent jump, chinning, push-ups, sidestep leg raising, alternate knee-touch hops and forehand knee-touch was named as "Everyman's Fitness Test." The results of the study indicated that in some tests the performances improved with age while in others the performances were irregular. Moreover, this battery was found to be hard as it caused muscle soreness.

Meyer (1968), with the aim of constructing a battery of valid tests to measure physical fitness, selected 42 motor performance variables. The tests were given to the boys and girls of 6-12 years of age. After statistical analysis of the data it was found that most of the test items in the battery were not the true measures of physical fitness. Only Criss Cross
Jump, Balance Stick, Softball Throw, Medicine Ball Throw, and Shuttle Run were found valid and reliable test items to ascertain physical fitness status of the subjects.

A study was conducted by Huntington (1968) to find differences in achievement between groups of boys at different strength levels on selected motor fitness tests. Four tensiometre tests were administered to 150 elementary school boys with the aim to form high, middle and low strength groups. Motor fitness tests administered were agility test battery, cardiorespiratory endurance test battery, power test and running speed test battery. The statistical analysis of the data led to the conclusion that cable tensi-metre strength test did not appear to be practical in predicting achievement on selected motor fitness test.

Walter (1971) conducted a study on 200 randomly sampled Cadets of USAF academy by administering twice the USAF Physical Fitness Test and USAF Academy's Candidate Physical Aptitude examination. The variability of test items involving multi-trials was analysed by using inter-class correlation technique. The findings of the study confirmed that the use of average score in lieu of the best score as the criterion measure appeared to be the proper method of scoring multi-trial test items. Both the tests were found to be reliable and valid.

McKenny (1972) selected 49 test items to prepare a motor fitness test battery for undergraduate male physical education
majors. The tests were administered to 121 subjects. After analysis of the data only five factors — speed-endurance, gross strength, power-agility, flexibility and muscular-endurance were isolated as components of physical fitness. Two test batteries consisting of five items each were developed. Test battery I contained the highest loading test items such as time-limit shuttle run, cable tension, 100 yards dash, thigh flexion flexibility and Rogers Physical Fitness Index. Test battery II was consisted of time-limit shuttle run, ankle planter-flexion strength, Illinois Agility Run, thigh flexion flexibility, and bar push-ups.

An attempt was made by Hissonette (1974) to identify the nature of fitness possessed by elementary school boys through factor analysis. Twenty four physical fitness evaluation items were administered to 112 boys, seven and eight years of age, and 117 boys, eleven and twelve years of age. After analysing the data five similar physical fitness factors were identified for all ages. They were named as body fat and dimensions, static strength, hip flexibility, recovery pulses and muscular endurance.

Another similar study was conducted by Romain (1977) to identify the factors that could be isolated as measures of physical fitness of the male and female pupils between 77 and 99 months of age. Seventeen motor fitness tests were administered to 213 subjects. Statistical analysis of data resulted in the formulation of two batteries of fitness items.
Battery I included six-second run, shuttle run, toe-touch and modified beam walking. Battery II consisted of modified side-step, 50 yards dash, standing broad jump, one minute lateral jump.

To determine the validity of 300 yards run as a measure of endurance Miller (1971) correlated the performance on this distance with that on 12 minute run/walk and Harvard step-test. The results indicated that 300 yard run could be considered as a valid measure of endurance because of its significant correlations with 12 minute run/walk test and the Harvard step test.

To ascertain the reliability of 600 metre run/walk Willgoose (1961) administered the test to 76 girls and 70 boys of 8th grade. The test was repeated after one week under similar conditions by the same set of officials. The coefficient of correlation between first and second tests were found to be highly reliable for boys as well as girls.

Fox (1959) undertook a study to establish the reliability and validity of Rogers Strength Test, the Kraus-Weber Test and Washington Battery. These tests were administered to 169 subjects two or more times in order to investigate the reliability of the tests. The results indicated that both Rogers Strength Test and the Washington Battery were reliable and the performances on these tests were found highly correlated to the performance on Kraus-Weber Test.
To check the credibility of the findings of Willgoose (1961) a follow up study was conducted by Askew (1966). Forty six girls and seventy one boys of grade II were given 600 metre run/walk test at two different times under similar conditions. The results of the two tests were analysed for significance with 't'-ratio technique. The results showed that 600 yard run/walk test was a reliable measure of an individual's ability.

Burke (1973) conducted a study to determine the validity of selected field tests in measuring physical work capacity. Ten laboratory tests and seven field tests were administered to 44 male college students of 17 to 30 years of age. It was concluded that 600 yard run, one mile run, and 12 minute run were valid measures of aerobic capacity whereas 100 yards dash and 50 yard dash were valid measures of anaerobic capacity.

Literature Related to Comparative Studies

Physical fitness norms for South African boys were established by Andrew (1976). A further study to compare their physical fitness level with those of Canadian boys were undertaken by him. To ascertain the physical fitness levels, the AAHPER Physical Fitness Battery (1966) consisting of one minute speed sit-ups, standing broad jump, shuttle run, flexed arm hang, 50 yard dash and 300 yard run was administered to South African as well as to Canadian students. Then 't'-test was applied to compare the mean scores of the two groups and South African boys were found better than their counterparts in Canada.
Another study to compare physical fitness norms for Brazilian and American school children was carried out by Barbanti (1983). Physical fitness battery consisted of 50 metre dash, nine minute run, 12 minute run, standing long jump, sit and reach test, and modified sit-up tests was administered to 2,342 boys and girls in both countries. The compared results revealed that American boys and girls, in general, were taller and heavier and their scores in 50 metre dash, standing long jump, sit and reach test and modified sit-ups test were higher than their Brazilian counterparts. On the other hand, Brazilian children scored higher on the nine minute run test.

A comparative study of the physical fitness level of the American boys and girls was conducted by Hunsicker and Reiff (1966). Physical fitness level of the students in the year 1965 was compared with the level of fitness of students who attended schools in the year 1957-58. AAHPER Youth Fitness Test was administered to 9,627 boys and girls from 110 schools in the coterminous United States and 1602 students from 18 schools in Alaska. Through statistical analysis of the data percentile scores based on age were developed for each item separately for boys and girls. The scores revealed that the physical fitness level of the public school children of grade 5 through 12 in the year 1965 was higher than those in the year 1958.

In another study conducted by Herman (1967) physical fitness level of the rural boys was compared with that of the urban boys.
AAHPER Youth Fitness Test was administered to one hundred rural and one hundred urban boys. The results showed that urban boys were superior to their counterparts from rural areas and the difference was significant at .01 level.

Median scores of the South Dakota boys of all ages were found higher than those of the national scores in a study carried out by Rasmussen (1970). Only in pull-ups and shuttle run the scores of the South Dakota boys were found lower than the national norms. In an identical study conducted by Busch (1970) the median scores of the South Dakota girls were also found higher than those of national girls in all items except for the flexed arm hang.

Performances of fourth grade children in Kraus-Weber test and California Physical Performance Test were compared by Anna (1958). California Physical Performance Test included 50 yard dash, standing broad jump, softball throw, sit-ups and push-ups. From the results obtained it was found that the children who failed in one, two or more items of Kraus-Weber Test also scored low in running, jumping, throwing and sit-ups. The children who passed in all the Kraus-Weber test items also got high scores in the four items of California Physical Performance Test.

Physical and motor fitness of 3400 boys and girls of 4 to 12 grades in the schools in Oregon was evaluated by Drawatzky and Madary (1966). Rogers Physical Fitness Index for boys and Oregon Motor Fitness Test for boys and girls were administered to the
subjects. Differences between means were tested for significance at .05 level by applying 't'-ratio. Results from the data revealed that the fitness level of students was favourable.

Motor-ability of the boys in the year 1934 was compared with that of the boys in the year 1967 by Poley (1970). The purpose of the study was to find out whether any changes had taken place in the motor-ability of the boys of ten to fourteen years of age during thirty years. Ten-item motor-ability test was administered to 3,249 boys from New Hampshire and Massachusetts. Performance level of these boys was found inferior to the level of those tested in 1934 where thirty-three item test of Nelson and Cozen was used. Another finding of the study was that in the year 1967 boys from urban areas had performed better than their counterparts from the rural areas.

In another similar study Robertson (1974) compared the physical proficiency of the 1972 - five year and seven year old boys and girls with those of 1954 - seven year old boys and girls. Pes-Cock Achievement Scale in Physical Education Activities was used for the study. Results showed that the 1972 - seven year olds were better than the other two groups. The 1954 - seven year olds differed significantly at .05 level of confidence from the 1972 - five year olds on all the test items, except side step.

Relationship of age and sex to the performance of 3 to 6 year old boys and girls on seven motor performance test items was examined by Morris (1982). The Scheffe's Post hoc analysis
procedure was used to analyse the data. Significant age and sex differences were found on most of the motor tests. With the exception of balance test, the performances of 3 and 4 year old boys on all the tests were identical. Similar was the case for 5 and 6 year old boys. In the case of girls there were significant differences in performance for all the ages.

An overview of the researches done in the area of evaluation of physical fitness suggested that both individual as well as professional organisations have given attention to the need for construction of tests and establishment of the norms. A large number of tests to ascertain the level of physical fitness have been suggested. In general two problems have been observed. Firstly, the studies were at variance as regards to the components of physical fitness. There is now an encouraging development since a consensus about the physical fitness components is emerging. Secondly, more than one tests have been suggested to measure the same component of physical fitness. The problem is further compounded by procedural variations which can result in varied performances by the same individual.

It was observed that tests suggested took care of both age and sex of the population where these were to be used. The outcome of this specificity was the emphasis on reliability and validity of the tests. In such attempts, many test items were considered and those found weak in assessing physical fitness have been discarded.
Norms as standard to evaluate the performances on test items have been established by many researchers. Norms on the same test item may differ on the basis of many factors which have direct bearing on the performances. It is, therefore, not unusual to have different norms for boys and girls, youth and adults. Carefully prepared norms have resulted in cross-cultural and international comparative studies. However, further concerted efforts are required to have more investigations.

In India awareness about the need of physical fitness is catching up. The research interest in the measurement of physical fitness and its evaluation through norms do fall short of any standard whatsoever. The gap in this context needs attention of physical educationists and other professionals in the allied disciplines.